

IN THE CLAIMS:

Please find a listing of the claims below, with the statuses of the claims shown in parentheses. This listing will replace all prior versions, and listings, of claims in the present application.

1. (Currently amended) An apparatus for speeding up Retinex-type processing of an input image, comprising:

a ~~sub-sampling algorithm, wherein~~ down-sampling module configured to produce one or more sub-sampled images of the input image ~~are produced;~~

a non-linear illumination estimation module that receives the sub-sampled images and produces corresponding interim illumination estimations; [[and]]

~~an one or more up-sampling algorithms, wherein~~ module configured to interpolate the interim illumination estimations ~~are interpolated to produce an illumination estimation, and wherein the illumination estimation is usable to perform a Retinex-type correction to the input image; and~~

an illumination manipulation module configured to combine the input image and the illumination estimation to produce an output image.

2. (Currently amended) The apparatus of claim 1, wherein ~~an the up-sampling module algorithm comprises an illumination interpolation algorithm, the illumination interpolation algorithm comprising an~~ is configured to implement an interpolation routine that receives the interim illumination estimations and a sampling rate, and produces the illumination estimation.

3. (Currently amended) The apparatus of claim 2, wherein ~~the illumination interpolation algorithm~~ the up-sampling module is further configured to enforce ~~comprises a local maximum routine, wherein the local maximum routine enforces an envelope constraint.~~

4. (Currently amended) The apparatus of claim 1, wherein ~~[[an]] the up-sampling algorithm~~ comprises:

~~a difference interpolation algorithm, the difference interpolation algorithm~~
receiving module is further configured to receive the difference of the sub-sampled images
and the interim illumination estimations, and a sampling rate and ~~producing to produce the~~
interpolated difference; and

wherein the up-sampling module is further configured to add ~~an adder that adds the~~
interpolated difference and the input image.

5. (Currently amended) The apparatus of claim 1, wherein the up-sampling algorithm comprises:

~~a difference interpolation algorithm that produces~~ module is further configured to
produce a difference-interpolated illumination estimation₁[[;]]

~~an illumination interpolation algorithm that produces~~ to produce an illumination-
interpolated illumination estimation₁[[;]] and

~~an average module, wherein to average~~ the illumination-interpolated and the
difference-interpolated illuminations ~~are averaged~~ to produce the illumination estimation.

6. (Currently amended) The apparatus of claim 5, wherein ~~the average module comprises~~
the up-sampling module is further configured to apply a difference weight and an
~~illumination weight, and wherein the difference weight is applied to the difference-~~
interpolated illumination estimation and to apply an [[the]] illumination weight is applied to
the illumination-interpolated illumination estimation.

7. (Original) The apparatus of claim 6, wherein the difference weight and the illumination
weight change from location to location in the image such that for every location the
difference weight and the illumination weight sum up to 1.

8. (Original) The apparatus of claim 6, wherein the difference weight and the illumination
weight each equal 0.5.

9. (Currently amended) The apparatus of claim 1, wherein the up-sampling ~~algorithm~~
~~comprises an~~ module is further configured to implement an interpolation cascade,
~~comprising:~~

said interpolation cascade being configured to perform a difference interpolation
~~algorithm; and~~
an illumination interpolation ~~algorithm~~.

10. (Currently amended) The apparatus of claim 9, wherein the up-sampling module is
further configured to perform the illumination interpolation algorithm following ~~follows~~ the
difference interpolation ~~algorithm~~.

11. (Currently amended) The apparatus of claim ~~[[8]]~~9, wherein the up-sampling module is further configured to calculate ~~comprising~~ a difference interpolation rate R_D , an illumination interpolation rate R_I , and an overall interpolation rate R_O , and wherein the interpolation rates R_D , R_I , R_O change from location to location in the image.

12. (Original) The apparatus of claim 11, wherein for every location in the image the interpolation rates R_D , R_I and R_O obey $R_D * R_I = R_O$.

13. (Cancelled).

14. (Currently amended) A method for speeding up Retinex processing of a high resolution input image, comprising:

producing one or more low resolution input images by sub-sampling the high resolution input image to produce one or more low resolution input images;

generating an interim illumination estimation for each ~~estimating an illumination of the one or more low resolution input images, wherein an interim illumination estimation is generated for each low resolution input image;~~

generating an illumination estimation ~~up-sampling the interim illumination estimation, wherein an illumination estimation suitable for Retinex-type correction is generated by up-sampling the interim illumination estimations; and~~

producing a Retinex-corrected output by combining the input image and the illumination estimation.

15. (Currently amended) The method of claim 14, wherein ~~up-sampling generating an~~
illumination estimation further comprises:

receiving the interim illumination estimations and a sampling rate to produce the
illumination estimation; and

enforcing an envelope requirement by applying a local maximum routine ~~to enforce~~
~~an envelope requirement.~~

16. (Currently amended) The method of claim 14, wherein up-sampling~~[[,]]~~ the interim
illumination estimations further comprises:

subtracting the one or more low resolution images and the interim illumination
estimations to obtain difference images;

receiving the difference images and a sampling rate;

producing the illumination estimation; and

adding the illumination estimation and the input image.

17. (Currently amended) The method of claim 14, wherein up-sampling the interim
illumination estimations further comprises:

producing a difference interpolated illumination estimation by applying a difference
interpolation algorithm to the interim illumination estimations ~~to produce a difference~~
~~interpolated illumination estimation;~~

producing an illumination interpolated illumination estimation by applying an
illumination interpolation algorithm ~~to produce an illumination interpolated illumination~~
~~estimation;~~ and

wherein generating the illumination estimation further comprises averaging the illumination interpolated illumination estimation and the difference interpolated illumination estimation to produce the illumination estimation.

18. (Currently amended) The method of claim 17, wherein averaging generating the illumination estimation further comprises:

applying a difference interpolation weighting factor to the difference interpolated illumination estimation[[s]]; and

applying an illumination interpolation weighting factor to the illumination interpolated illumination estimation.

19. (Original) The method of claim 18, wherein the difference interpolation weighting factor and the illumination interpolation weighting factor sum to 1.

20. (Currently amended) The method of claim 14, wherein the up-sampling generating the illumination estimation further comprises:

implementing applying a difference interpolation algorithm module; and

applying an illumination interpolation weighting factor, ~~wherein the illumination estimation is generated.~~

21. (Canceled).

22. (Currently amended) A method for speeding up Retinex processing of an image, comprising:

~~producing sub-sampling the image to produce low resolution images by sub-sampling the image;~~

~~generating an interim illumination estimation for estimating an illumination of each of the low resolution images, wherein an interim illumination estimation is generated for each of the low resolution images;~~

~~producing a difference interpolated illumination estimation by implementing applying a difference interpolation module on algorithm to the interim illumination estimations to produce a difference interpolated illumination estimation;~~

~~producing an illumination interpolated illumination estimation by implementing applying an illumination interpolation algorithm module to produce an illumination interpolated illumination estimation; and~~

~~averaging the illumination interpolated illumination estimation and the difference interpolated illumination estimation to produce the illumination estimation.~~